REMARKS

Claims 1-15 and 20-27 are currently pending. Claim 23 has been amended. Claims 12-15 were previously allowed.

Claims 1, 4, 7-10, 20-21, 23 and 27 were rejected under 35 U.S.C. 103(a) as being unpatentable over Cai et al. Optical Fiber Communication Conference and Exhibit, 2002, 17-22 Mar pp 654-655 in view of DiGiovanni et al (US 5237576. The Examiner states that Cai "teaches a polarization dependent resonant cavity (inherent since the PZT would induce birefringence and cause a change of polarization)" and further that it would have been obvious to one of ordinary skill in the art to combine such a resonant cavity with the narrowband and broadband gratings of DiGiovanni. Applicant respectfully disagrees.

Cai reports on a Q-switched erbium doped fiber laser using a fiber Bragg grating placed in loop mirror (FBGLM) as an all-fiber wavelength-selective intensity modulator. Cai's FBGLM acts like a Michelson interferometer in which Q-switching is achieved with a PZT that stretches/compresses the fiber axially to *change the optical path length* between the 3dB-coupler and the FBG in the upper portion of the loop. A detailed explanation of the FBGLM is provided in Zhao et al. as cited by Cai.

Cai's Q-switched fiber laser is far different than that described and claimed by the Applicant. Cai's laser describes a mechanism for Q-switching that is based on varying the optical length of the fiber. The physical principle behind this switching mechanism assumes non-PM fiber and a configuration that is polarization insensitive. If the PZT were to induce any significant birefringence through, for example, a structural imperfection in the stretching/compression mechanism, the FBGLM could not

achieve the extinction ratio of greater than 16dB reported in Zhao. Therefore, it would be not only redundant to provide a second Q-switching mechanism but the provision of a polarization dependent cavity and the application of stress to induce birefringence would be incompatible with the primary switching mechanism taught by Cai.

In addition to being incompatible with the Q-switching mechanism based on Michelson interferometry, Cai simply does not teach either a polarization dependent resonant cavity or application of stress to the fiber to induce birefringence. None of the fiber components in the Q-switched laser shown in Figure 4 are polarization-maintaining or in any way polarization dependent. It is not accurate to say that the PZT induces birefringence that causes a change of polarization, and thus conclude that the resonant cavity is inherently polarization dependent. First, Cai's PZT does not produce birefringence. Birefringence occurs when a material displays two different indices of refraction n_x and n_y in a cross-section of a fiber. The axial stretching/compression of a fiber formed from an isotropic material does not create a meaningful difference in the two indices. Second, inducing birefringence does not make the resonant cavity polarization dependent. Even if one were to reconfigure the PZT to apply stress to the cross-section of the fiber (instead of axially) to induce birefringence, this would not be sufficient to switch the cavity Q factor because the cavity is not polarization dependent. As described and claimed in the present invention, the two are distinct features that interact to provide the Q-switching.

Claim 1 is directed to a modulator that applies stress to a non-PM portion of a fiber chain in a polarization-

dependent cavity to induce birefringence and switch the cavity Q-factor. This combination of features is not taught nor suggested by Cai in view of DiGiovanni and would not be obvious to one of ordinary skill in the art at the time of the invention.

Claim 20 is directed to a modulator that affects the polarization of light oscillating in a polarization dependent resonant cavity to reduce the Q-factor to store energy in the gain medium and then return the Q-factor to its high value to release the energy in a laser pulse. Cai in view of DiGiovanni do not teach modulating the polarization of light oscillating in a polarization dependent resonant cavity to Q-switch a laser.

Claim 23 is also directed to a modulator that applies stress to a non-PM portion of a fiber chain in a polarization-dependent cavity to induce birefringence and switch the cavity Q-factor. Claim 23 is amended to further recite that at least one of the gratings or gain medium is formed in PM fiber and that the applied stress induce birefringence in a cross-section of the stressed fiber chain to more particular point out the invention (See Fig. 4b).

Conclusion

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance

The Examiner is invited to call the undersigned at below listed telephone number if, in the opinion of Examiner, such a telephone conference would expedite or the prosecution and examination of this application

Respectfully submitted,

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Date: February 6, 2006

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